D 7.24:984/3

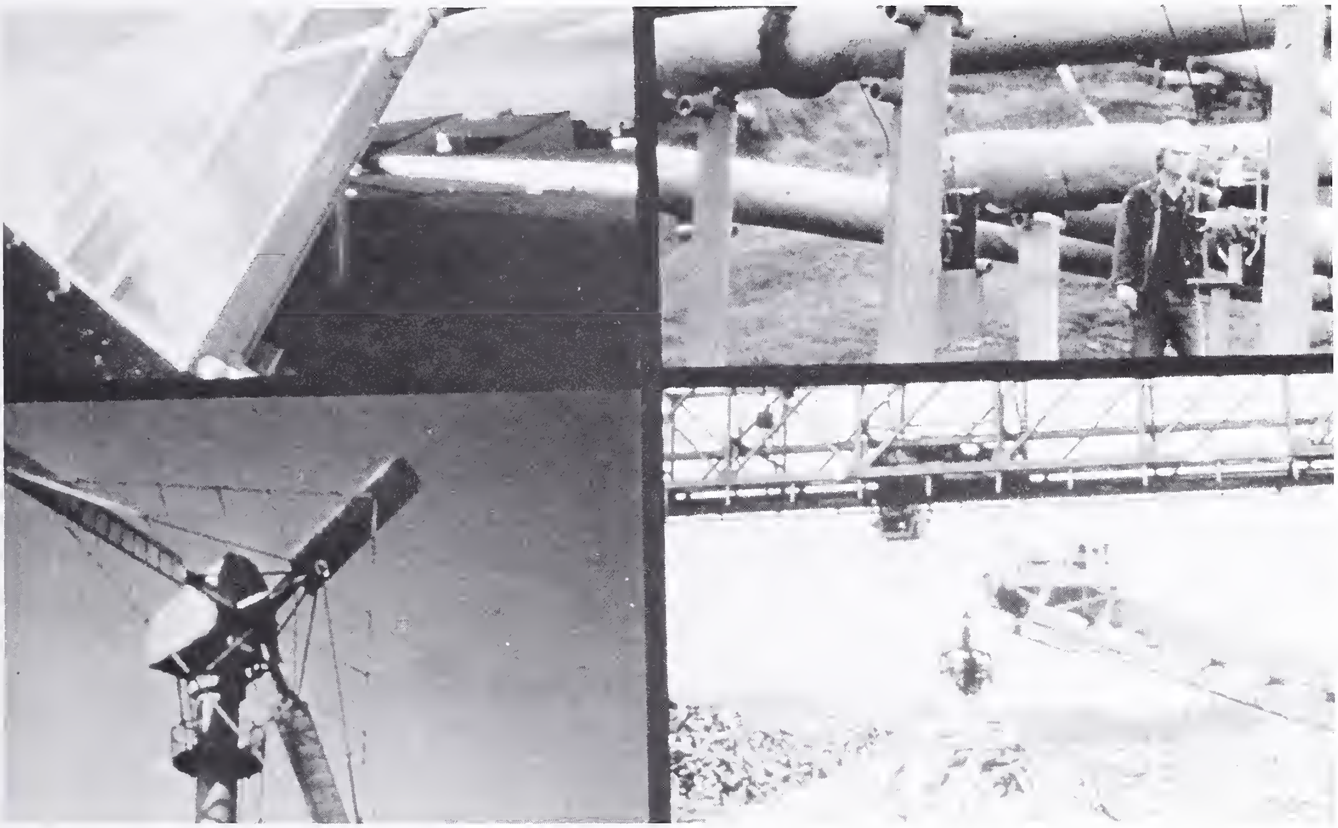
UNIV. OF FLA. LIB. ★ DOCUMENTS DEPT
NOV 5 1984
★ U.S. DEPOSITORY ★

AUTUMN 1984

DFSC

FUEL LINE

DEFENSE FUEL SUPPLY CENTER ● CAMERON STATION ● ALEXANDRIA, VIRGINIA



Who compiles DOD energy statistics? (We do.)

INSIDE:

DGSC relates some adventures with packaged petroleum products.

Synthetic fuels are as vital as conservation, stockpiles.

Mining again—this time, for OIL.

What about the Persian Gulf?

DFSC
Fuel Line
A DEFENSE FUEL SUPPLY CENTER TECHNICAL PUBLICATION

DFSC Collects Defense Energy Information

Did you know that DFSC is the central DOD depository for all forms of energy data — except that associated with nuclear power? Refinements in DEIS have made it even more accessible for DOD users.

1

Conservation, Stockpiles, and Synthetic Fuels Safeguard U.S.

We've learned a lot since the oil embargo — but are conservation programs and stockpiles enough to safeguard U.S. energy?

3

Update on the DFSC MBO Program

FUEL LINE asked for updates on MBO accomplishments and problems — and stories came from a variety of places.

7

DFSC Helps Monitor Fuel Quality

DFSC, DCAS, and the military services cooperate in a quality assurance and surveillance program that "keeps the gum out" of petroleum products

11

Alive and Well: Army Oil Analysis Program

Army oil tested after use provides vital clues on equipment wear and tear.

13

New Mission Assigned to DGSC Underway

When the DFSC lubricants and specialty products division was dissolved, the Defense General Supply Center assumed responsibility for packaged petroleum products. This article details their involvement since the transfer of functions.

15

Science Helps Hasten Search for Petroleum

New oil sampling techniques developed in the United Kingdom save companies time — and money.

17

A Self-Controlled Method to Speed Up Fuel Alcohol

The trick to the new method is the development of strains of yeast that thrive in high concentrations of alcohol.

18

U.S. Achieves 80-Day Reserve "Cushion"

Over 400 million barrels of crude oil are now in the SPR and with the renewed conflict in the Middle East, Department of Energy talk is turning to when and how the reserves might be used.

19

Logistics Unit Productivity

Unit productivity studies in the Army point to improved fuel system supply points for petroleum supply companies.

20

What About the Persian Gulf?

Although the U.S. imports less oil from this region than it did 10 years ago, about 20 percent of the free world's total oil supply comes from the Persian Gulf and a serious disruption would indirectly affect our Nation.

21

EIA Forecasts Ample Supplies, Continuing Conservation

EIA predicts growth in nuclear power but petroleum will continue as the major fuel used through 1995.

22

Fast Fuel Forward

Satisfying the nearly insatiable fuel appetite of the M1 tank with its 510-gallon bite and its equally thirsty BFV battle partner is a real logistics challenge for troopers of the forward support battalion petroleum section.

23

Mining For Oil

Oil mining was once an activity reserved for other lands, including France, the USSR, and Australia. Now Americans are getting in on it — in the oil fields of northwest Louisiana.

26

FUEL LINE GLEANINGS

27

AUTUMN 1984

FUEL LINE is an official publication, prepared quarterly by and for the Defense Fuel Supply Center and fuel-oriented clientele. FUEL LINE is designed to provide timely, factual information on policies, plans, operations, and technical developments of the Defense Fuel Supply Center and other interrelated subject matter. Views and opinions expressed in FUEL LINE are not necessarily those of the Department of Defense.

Submissions and inquiries should be addressed to: Defense Fuel Supply Center, Editor, FUEL LINE, Office of Public Affairs (DFSC-AP), Cameron Station, Alexandria, Virginia 22304-6160. Telephone: (202) 274-6489, or AUTOVON 284-6489.

Major photographic services are provided by the Defense Logistics Agency Administrative Support Center, Technical Presentations Division.

Rear Admiral William J. Ryan
SC, USN
Commander
Defense Fuel Supply Center

Colonel Larry E. Bower, USAF
Deputy Commander
Defense Fuel Supply Center

Donald J. Peters
Public Affairs Officer

Linda M. Stacy-Nichols
Editor

Judging, Gauging, Tracking

DFSC Collects Defense Energy Information

by Linda Stacy-Nichols

It's reported in thousands of cubic feet, in short tons and megawatt hours, in pounds of steam, in barrels and in gallons. It's wind and wood, solar and thermal, hydroelectric, coal, and gas. It's Department of Defense (DOD) energy and it's all accounted for in the Defense Energy Information System (DEIS).

Developed and managed by the Defense Fuel Supply Center (DFSC), DEIS was mandated by DOD in 1973. Inspired by the disruption created during the oil shortage, DEIS is the central DOD depository for all forms of energy data except those associated with nuclear power. Under the guidance of Samuel M. Bradshaw, chief of the management information and analysis division, office of the DFSC comptroller, two subsystems were established to accommodate consolidated energy reporting to the Secretary of Defense (OSD) and the military services. DEIS-I processes information for and reports inventories, receipts, and consumption of petroleum products within DOD. This category includes such energy sources as aviation gasoline, jet fuels, and motor gasoline. DEIS-II processes similar data but reports on utility energy within DOD, including electricity, natural gas, coal, fuel oil, and less prevalent sources such as solar and wind power and fuel developed from refuse.

Feeder information for DEIS reports is required from all base-level activities and ships worldwide with approximately 1400 submissions made for each monthly reporting period. Each activity reports three data lines. The first line includes inventory issues, receipts from commercial contracts, receipts from DOD, and closing inventory. The second data line describes the use to which a particular product is applied. To track detailed issue data for all products used by activities other than the one reporting, the third data line is employed. From these three automated transactions, summaries may be prepared on consumption by military services, losses, credit card purchases, and other categories of interest.

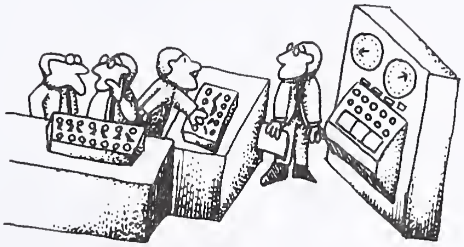
While DOD elements strive to meet the goal of a 20 percent reduction in facility energy by September of next year, DEIS-II provides the data needed to track conservation progress. Recent refinements in the automation of DEIS now enable a hundred or so DOD organizations to directly access DEIS information and generate ad hoc reports as needed. Not only does this enhancement free DFSC from preparing, printing, and distributing voluminous reports, it provides users with the most current information possible. Although energy reduction is an overall Defense goal, the ability to tap into DEIS and isolate each reporting area helps pinpoint problem areas. Individualized reporting may also highlight an activity which had experienced an increase in energy needs because of additions to mission and thus allow for better planning and resource allocation. (For the first time ever, DEIS-II was amended this year to track the consumption of facility energy in family housing.)

Each product in DEIS-II is assigned a British thermal unit (Btu) rating which provides a standard to judge its relative energy value. (A Btu is the amount of heat required to raise one pound of water one degree.) Incorporated into DEIS is an energy credit system to encourage use of alternate fuel sources. For example, activities which reclaim damaged fuel oil (damage usually incurred by water contamination on board ship) are rewarded with conservative Btu ratings for fuel used even though the actual value of the reclaimed oil may be on par with uncontaminated fuels.

Refinements to the system continue. One change soon to be implemented is a provision for more frequent accounting in cases of peacetime disruptions, incidents, or emergencies which may affect individual reporting elements (e.g., natural disasters, accidental breaks in supply lines, or labor disputes). The Peacetime Energy Emergency Reporting System (PEERS) provides information on consumption, inventory, and receipts for both petroleum and non-petroleum products at affected installations. Reports may be requested daily, twice weekly, weekly, or twice monthly.

DEIS has come a long way since the first input cards were compiled manually. When the system was first automated, it had limited computation and compilation abilities and could not perform complex analyses needed to track, judge, and gauge DOD energy. Now Mr. Bradshaw forsees a time when the system will be even easier to use.

"I am looking forward to the day," said Bradshaw, "when we can simply ask DEIS: 'What was the DOD energy use in North Carolina last month?' " **FL**



"Although energy reduction is an overall DOD goal, the ability to tap into DEIS and isolate each reporting area helps pinpoint problem areas. Individualized reporting may also highlight an activity which has experienced an increase in energy needs because of additions to mission and thus allow for better planning and resource allocation."

Conservation, Stockpiles, and Synthetic Fuels Safeguard U.S. Energy

> *"Although we have vast potential for producing a considerable amount of our mobility fuel from coal, shale, tar sands, and other underutilized sources, such efforts tend to fall by the wayside when inexpensive petroleum is available."*

by Eddie French

The history of synthetic fuels (synfuels) is one tempered by haphazard interest. Countries throughout the world have consistently neglected synfuels development when energy stocks were plentiful, industries were flourishing, and economies were thriving. Experimentation and production began abruptly again when circumstances depleted energy resources or increased prices. Examples include the use of synthetic fuels by the German army at the end of World War II, shale oil production in Scotland prior to the North Sea oil discoveries, experimentation with shale oils and alcohol fuels in Brazil, and coal liquids in South Africa. Most of these programs were quickly dissolved when petroleum became accessible and relatively inexpensive again.

The United States has also zigzagged in its attention to synthetic fuels. Although we have vast potential for producing a considerable amount of our mobility fuel needs from coal, shale, tar sands, and other underutilized sources, such efforts tend to fall by the wayside when inexpensive petroleum is available. Synfuels development was first discussed seriously in the U.S. some 60 years ago, but didn't receive much impetus until World War II when President Harry S. Truman, inspired by the German use of coal-derived fuels toward the end of the conflict, implemented an exploratory program. Although President Dwight D. Eisenhower supported the Truman program, the abundant supply of cheap petroleum stymied widespread interest in synfuels development.

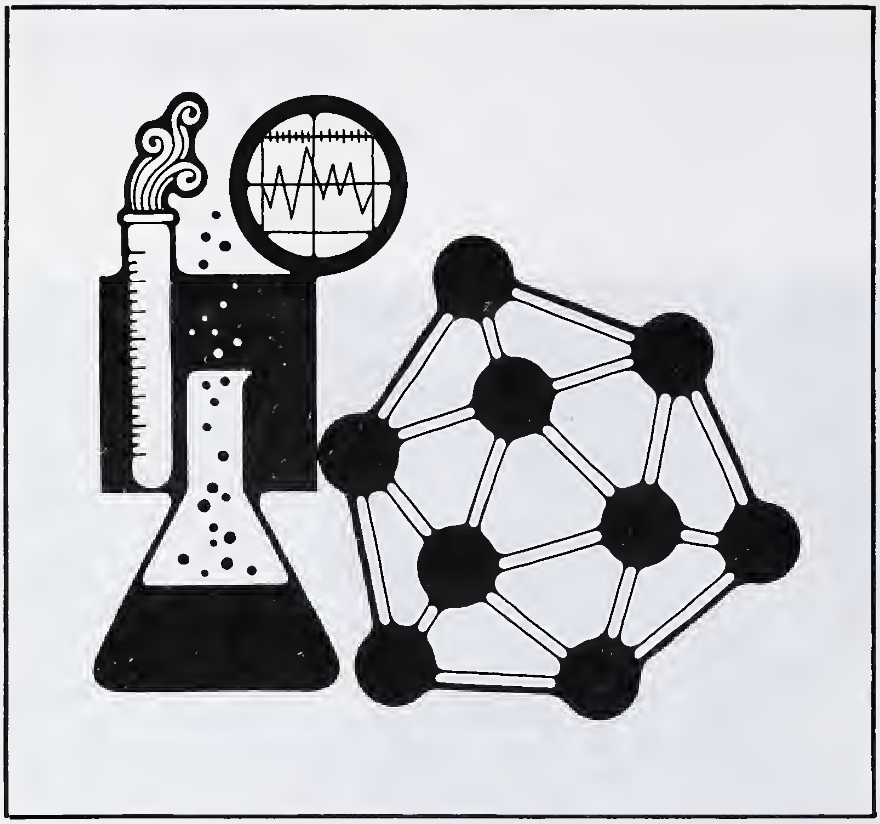
As early as 1944, U.S. officials were troubled by our increasing dependence on imported oil and realized that our national security was hampered by inattention to alternate energy sources.

But it still took the explosive events of 1973 to arouse renewed interest in synfuels—and in other measures that would make the U.S. energy independent. The oil embargo against selling supplies to the United States ultimately proved damaging to sellers as well as buyers, but it provided a harsh lesson all energy-dependent countries will not soon forget.

As a result of the disruption and the lessons learned, several measures were taken by the legislative and executive branches of the Federal Government: the Federal Energy Administration was established to regulate the petroleum industry, the Energy Research and Development Administration was instituted to perform research and develop demonstration programs, the Alaskan pipeline was approved, the Strategic Petroleum Reserve was established, the Naval Petroleum Reserves began operation at a maximum efficient rate, the Department of Energy was established, and the Synthetic Fuels Corporation began operation.

More than a decade has passed since the oil embargo. We have made strides in three crucial areas. One of the first steps taken was the stockpiling of crude in the Strategic Petroleum Reserve. This program is progressing solidly, with some 425 million barrels of crude oil now in storage. Conservation is the second keystone to our energy independence. Between 1978 and 1983, energy consumption declined from approximately 19 million barrels of oil per day to 15.5 million barrels per day. Domestic production of liquid hydrocarbons has held at about 10.5 million barrels per day. During 1984, consumption increased somewhat to 16.5 million barrels per day, still far short of peak consumption in 1978.

HALE-OIL
ESEL FUEL
CRUDE SHALE OIL
REG GRADE
SHALE-OIL
GASOLINE
72 OCTANE



"In any event, if the United States continues to depend on petroleum as our primary energy source, synthetic fuels will indeed be produced in the future—the unknown factors are 'when' and 'at what cost.'"

Finally, synfuels production is coming into its own, with research and development programs already completed on coal gasification, coal liquefaction, shale retorting, shale upgrading, tar sand extraction, biomass development, mobility fuel specifications, and mining technology. We now know how to produce innovative fuels more efficiently and with less environmental impact than was possible 10 years ago.

PRESENT PROGRAMS

Three major synfuels plants were completed this year. Two began contributing to the nation's energy supplies in mid-1984. The third is expected to begin production before the end of the year. Now that the problems of these fledgling programs are being resolved, talk is turning to second generation refinements.

The **Coolwater** project in California is producing industrial gas from coal. The gas is then employed to create electricity. The project began on schedule and has stayed within its budget.

The **Great Plains** program, based in North Dakota, has made a major step forward in coal gasification. The gas may be transported via pipeline for home heating use or may be used as a feedstock for the chemical industry. **Great Plains** has experienced some difficulty because of a decreased market value of natural gas. As a result, the Synthetic Fuels Corporation (SFC) has negotiated a deal to provide a guaranteed price for the gas produced during the early years of the project. In turn, the agreement provides that the SFC will benefit if there is an upturn in the price of natural gas. This revenue-sharing clause is included in most SFC contracts, thereby allowing the government the opportunity to recuperate some of the money provided in the early stages of synfuels projects.

The **Union Oil Company** oversees the only shale oil project of commercial size currently under development. The company is using a proprietary process of retorting to produce the shale oil. Technical problems have delayed start-up for several months, however, and the company now anticipates the project will operate by 1985.

Other synfuels projects are in the government's evaluation stage, pending final decisions by SFC board members.

WHAT NEXT?

The synfuels program changes as the economic and political environment is transformed. Currently, synfuels is the focus of a great deal of public controversy. The level of interest in development in the private sector has concurrently diminished as adequate energy supplies remain available. Consequently, it appears synfuels production will be less than was planned for in 1980. This unfortunate situation may be compared to the Alaskan oil pipeline debate of the early 1970s. The pipeline was stalled by legal and environmental concerns — until the U.S. suffered a severe shortage of petroleum.

Is the synthetic fuels program in a similar holding pattern?

In any event, if the United States continues to depend on petroleum as our primary energy source, synthetic fuels will indeed be produced in the future—the unknown factors are "when" and "at what cost." **FL**

EDDIE FRENCH is the director of the Defense Fuel Supply Center's office of synthetic fuels.

SYNFUELS—WHAT ARE THEY?

This summary describes the most common materials and processes used in the production of synthetic fuels.

COAL GASIFICATION—This process employs air and water in chemical reaction with the carbon in coal. The gasification procedure forms methane, carbon monoxide, carbon dioxide, and hydrogen. Additional processing is used to produce hydrocarbons for pipeline gas, but the initial product may also be consumed directly where low to medium British thermal unit (Btu) product is needed. Processes have also been developed for in-situ (in-place) gasification of coal where resources cannot be mined.

There are many variations of gasification systems with patents held by U.S. and foreign firms. In the U.S., the Great Plains project uses Lurgi gasifiers in the first step of gasification.

COAL LIQUEFACTION—Direct liquefaction consists of the addition of hydrogen to the carbon in coal by use of a catalyst and solvent under controlled temperature and pressure conditions. Indirect liquefaction employs gasification of the coal followed by catalytic hydrogenation of the gas to form desired hydrocarbons.

SHALE RETORTING—Shale retorting consists of heating the shale to approximately 950 degrees Fahrenheit under controlled conditions. At this temperature, oil and gas are produced from carbon molecules contained in the shale. Because the oil is hydrogen deficient, it must be upgraded by hydrogenation. As with coal gasification, several processes have been developed for in-situ and aboveground use.

TAR SAND EXTRACTION—This procedure involves digesting the tar sands with hot water or solvent to separate the bitumen (oil or tar) from the sand. Different methods are used depending on the mineral content of the sands. The in-situ methods which have been developed for separating the bitumen and sand are especially attractive because it is not necessary to move large amounts of solid material. (Moving costs for such processes may be as expensive as $10 per barrel of oil.)

BIOMASS—Biomass is a catch-all term which encompasses a variety of conversions, including: transformation of waste materials from cities into gas and oil; conversion of farm products to alcohols, oils, and gas; conversion of animal wastes to gas; and utilization of specially-processed wood in coal-burning boilers.

Working Toward Goals

"In sum, 130 goals constitute the DFSC program. Although emphasis is placed on the eight agency objectives, the DFSC program is also tailored to meet the needs of DFSC's unique mission."

In accordance with Defense Logistics Agency (DLA) direction, all primary level field activities (PLFAs) developed management by objectives (MBO) programs detailing goals which support the eight DLA general mission objectives. Agency objectives include improvements in the categories of force readiness, finances, management, productivity, acquisition, personnel, facilities, and prevention of fraud, waste, and abuse (mismanagement). The Defense Fuel Supply Center (DFSC) published its MBO program in June 1982 and updates objectives and deadlines quarterly.

The DFSC MBO program, which is coordinated by Stella Hatcher, a logistics management specialist in the office of planning and management, outlines goals developed by each organization throughout DFSC —including both headquarters and field activities.

In sum, 130 goals constitute the DFSC program. Although emphasis is placed on the eight agency objectives, the DFSC program is also tailored to meet the needs of DFSC's unique mission. Most goals therefore, fall into the categories of force readiness, management, and prevention of fraud, waste, and mismanagement (abuse). The facilities area also drew a high number of DFSC goals, however, because of emphasis on improving the conditions and management of government-owned contractor-operated petroleum storage facilities.

Following are some brief summaries of specific MBO goals and how they were achieved.

——— by Stella Hatcher

STELLA HATCHER is a logistics management specialist in the Defense Fuel Supply Center's office of planning and management.

Office of Planning and Management: Development of a Sourcing Model

A major part of the Defense Fuel Supply Center's (DFSC) strategic planning efforts is identification of likely sources of refined petroleum products to meet the greatly increased demands of an overseas commander during a war. To accomplish this, a DFSC planner consults a computerized listing of wartime requirements and selects a refinery (from a list of potential candidates) that has or can produce fuel needed in sufficient time for delivery by the Military Sealift Command. This refinery selection process is more commonly called "sourcing the requirements."

Sourcing is a slow, laborious process because the planner must evaluate all potential refineries (sources) in processing each individual requirement. Suppose, for instance, a theater commander gives DFSC a wartime list of 250 requirements for fuel. Each source requirement evaluation requires two computations: one for fuel availability; another for transit time. If there were 55 candidate refineries to be used as sources, the planner would need to perform 27,500 calculations. If each calculation took 1 minute to perform, the process would require almost 3 weeks of nonstop work. Since there are more than 16 different wartime scenarios, each with its own list of petroleum requirements, it would require 3.6 manyears to completely "source" all the

"Each source requirement evaluation requires two computations: one for fuel availability; another for transit time. If there were 55 candidate refineries to be used as sources, the planner would need to perform 27,500 calculations. If each calculation took 1 minute to perform, the process would require almost 3 weeks of nonstop work."

scenarios. (This estimate does not account for the various combinations possible among the 16 scenarios.) Because the requirements list for each scenario is updated every 2 years, we would obviously be losing ground if we attempted to source all possibilities.

Luckily, such repetitive calculations can be handled by a computer. DFSC asked the Defense Logistics Agency (DLA) to seek the Office of the Joint Chiefs of Staffs' (OJCS) assistance in developing a computer program to perform this sourcing function. OJSC assigned its command and control technical center to design such a program, which is scheduled to be on-line by the end of summer 1984. Not only will DFSC have results on sources generated in minutes instead of days, the computer program will provide greater accuracy in computations, and will allow for identification of potential disruption points in a simulated wartime supply system.

Office of the Comptroller: Query Capability for DEIS-II Users

The Defense Energy Information System subsystem II (DEIS-II) processes data for and reports the inventories, consumption, and conservation of utility energy within the Department of Defense. In the early days of DEIS-II, printed reports were prepared and distributed to the Office of the Secretary of Defense and military service activities. The reports were quite voluminous and simply printing and distributing them were monumental tasks. From the beginning of DEIS-II, it was realized that direct on-line access to the data base by the system users was needed. This would allow the military services to query the system at any time for specific data and produce any up-to-date report required.

System design for the modification was completed in September 1982. Programming was assigned to the Air Force Data Services Center (AFDSC). In November 1982, an MBO goal was established by the DFSC management information and analysis division to place more emphasis on the DEIS-II modification.

During the period November 1982 through December 1983, DFSC personnel in the management information and analysis division and the office of telecommunications and information systems worked closely with AFDSC representatives. Working level meetings were held at the Pentagon and Cameron Station. System design problems which surfaced during the programming stage were resolved, hardware needs were identified, and system testing began in October 1983. User training sessions were conducted at Cameron Station and Bolling Air Force Base in November, and baseline data were loaded in December 1983. The system was operational in January of this year. (See related story on DEIS, this issue.)

Equal Employment Opportunity Office: Achieving an Integrated Workforce

As of November 1983, the end of the 6-month reporting period, the Defense Fuel Supply Center had hired 67 employees in professional and semi-professional career fields. Of those selected, 48 percent were

MBO

classified as minorities or women, and 52 percent were considered non-minority personnel. As a result of these selections, the percentage of equal employment opportunity goals reached during the 6-month period of 31 May-30 November 1983 rose from 63 percent to 88 percent.

(As this issue went to press, another eleven minority and women employees had been hired in the directorate of technical operations.)

Defense Fuel Region Southeast: Pipeline Operating Agreements

Defense Fuel Region Southeast (DFR-SE) has six closed pipeline carriers who service some Defense Fuel Supply Center customers. These carriers operate under a tender agreement and DFRs are assigned the responsibility for issuing and administering a pipeline operating agreement for each pipeline. This was accomplished at DFR-SE through negotiations with the pipeline carriers, the receiving activities, and the cognizant quality assurance representatives. After consultation with the counsel's office, the technical operations directorate, and the supply operations directorate, the final pipeline agreement was signed in February 1983.

Defense Fuel Region Northeast: Reduction of Transportation Costs

In July 1982, the Defense Fuel Region Northeast (DFR-NE) established several specific objectives and goals designed to recognize and control fraud, waste, and mismanagement. One primary objective was to reduce transportation costs through greater emphasis on shipment routing and control, to increase management control of all less than truckload (LTL) shipments, and to institute a review program for carrier billings to determine and recover overcharges.

By December 1982, DFR-NE had reviewed and updated all distribution patterns and made selections, reworded the free time allowance on barge contracts to take advantage of the maximum loading and discharging capabilities at terminals and instituted an audit procedure for all freight bills. By January 1983, the region had developed an LTL control and reporting system and by April 1983 had established a reporting system to pass carrier overcharges to the General Services Administration for collection.

Defense Fuel Region Southwest: Improving Assistance to Customers

Defense Fuel Region Southwest (DFR-SW) has worked with customers at installations to identify and resolve problems with emphasis placed on the Defense Fuels Automated Management System (DFAMS). On-site visits by DFR-SW personnel have led to numerous on-the-spot corrections and minor changes in procedures which have improved the accuracy of documentation while reducing administrative workload. Meetings with customers also produced significant progress in resolving the problem of entering data into DFAMS without

M B O

hard copy supporting documentation. Based on DFR-SW initiatives in this area, revision to the DFAMS manual now allows transactions via telephone. This has shortened the DFAMS processing cycle by as much as 14 days.

Defense Fuel Region West: Pipeline Operating Agreements

A large part of the Defense Fuel Region West's (DFR-W) support to its 107 customers flows through six common carrier pipelines. DFR-W is only one customer of these pipelines, sharing their operating time with a number of commercial oil companies. For instance, Defense Fuel Supply Center fuel in the CalNev pipeline to Edwards, George, and Nellis Air Force Bases accounts for only 20 percent of the fuel traveling through that pipeline [CalNev's main commercial purpose is to provide gasoline and jet fuel to the thriving population of Las Vegas.]

Because of the Government's stringent controls for quality and inventory, however, DFR-W is a little different in its relationship with the pipeline companies than are commercial customers. Its unique controls require that it substitute negotiated operating agreements for the standard commercial tariff which binds other customers.

Because of numerous recent developments, the most significant being the implementation of the Defense Fuels Automated Management System, DFR-W has made updated operating agreements with these six pipelines a management objective.

The DFR-W transportation manager, William Rosenberg, rewrote each agreement, incorporating all changes required by current regulations and operations. After draft agreements were forwarded to the DFSC directorates of technical operations and supply operations for review, they were forwarded to Defense Contract Administration Services quality assurance personnel and the military bases involved for concurrence.

The agreements were then forwarded to the six pipeline companies in August 1983. As this edition of the *Fuel Line* went to press, five of the agreements had been signed (the latest in June 1984) and the last was pending. FL

M

B

O

Getting the Gum Out—

DFSC Helps Monitor Fuel Quality

by Linda Stacy-Nichols

Like frozen foods which may thaw and pharmaceutical preparations which may perish, Defense Fuel Supply Center (DFSC) petroleum products are among the Defense Logistics Agency's vulnerable commodities. Although these volatile substances are capable of propelling tons of iron and steel over great distances, long periods of storage sometimes subject petroleum products to a variety of changes that can render them unsuitable for their intended use. Even with the most judicious handling and storage, fuel characteristics may be changed by such quality detractors as weathering gum formation, loss of crucial inhibitors (those which reduce ice in airplane fuel systems, for example), contamination by dirt, rust, water, or microbiological growth, and commingling of different types of fuel.

The same types of contaminants which trouble the family subcompact can also affect the operation of jets, tanks, submarines, ships, and the other massive machinery used in our Nation's defense. Effects from the use of contaminated or deteriorated fuel range from engine failure on the administrative vehicle to reduced power of propulsion system components at critical moments of operation which may result in the loss of aircraft and life.

To forestall such problems, DFSC, the Defense Contract Administration Service (DCAS), and military personnel participate in petroleum quality assurance (PQA) and quality surveillance (PQS) programs which network the world. Within the continental United States (CONUS), DCAS is responsible for PQA and DFSC and the military services are responsible for performing PQS. Overseas, both DFSC and the military services perform PQA and PQS in specifically assigned areas.

Quality assurance programs are used at refineries and supply contractors' facilities to determine whether products meet contractual specifications for quality and quantity before they are accepted as government property. Quality surveillance programs are implemented once petroleum products become U.S. property, even though fuels may still be stored in commercial distribution systems such as pipelines and storage tanks.

Although quality surveillance testing is conducted any time deterioration or contamination of fuel is suspected, it is also performed on a routine basis at intervals prescribed in a quality surveillance handbook. Depending upon the type of fuel being examined, a wide range of tests may be conducted to determine presence and levels of sediment, water, or some other contaminant, changes in color, specific gravity, existing and potential gums, carbon residue, vapor pressure and tetraethyllead content. Each of these tests provide clues to the fuel's rate of deterioration and type of contamination, if any. Even before testing is conducted, however, quality surveillance representatives (QSRs) must have a working familiarity with the types of problems likely to occur in particular kinds of fuel. Weathering, for example, is most noticeable in motor and aviation gasolines where it is evidenced by a loss of volatility.

Because quality assurance representatives (QARs) must ensure that products meet contractual specifications, their work is slightly different than that of QSRs. DFSC maintains 16 quality assurance residencies located in Curaçao, Aruba, St. Croix, Puerto Rico, Mexico, England, France, Italy, Sicily, Greece, Bahrain, Hawaii, Guam, the Philippines, Japan, and Singapore. Although the QARs' duty stations may be pleasant, the work itself is anything but glamorous.

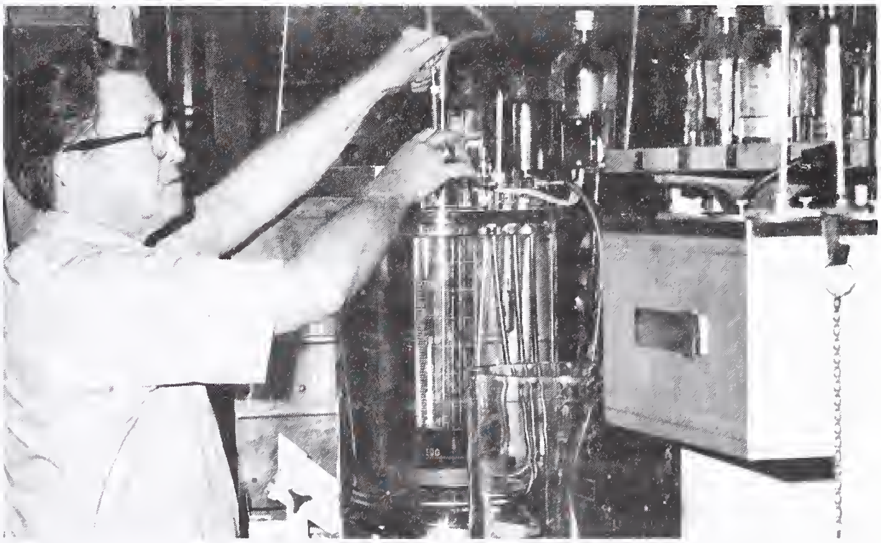
QARs are responsible for observing contractors as they conduct their own government-approved fuel testing to ensure that the proper methodology is employed. Because the fuel received may be transported by barge, ship, tank car, truck, or pipeline, every observation may become an adventure. Loading fuel on board tankers, for example, may take up to 48 hours, during which time continuous sampling must take place. Because QARs are also responsible for ensuring tanks are clean and valves properly positioned, they must often climb into anywhere from 21 to 30 50-feet deep cargo compartments to perform inspections. Once the loading of the vessel is completed, QARs must ensure that proper gauging techniques have been used to measure fuel amounts. Other responsibilities of the QAR include completing paperwork, monitoring movement of petroleum products via single and multiproduct lines, ensuring proper packaging and marking, and checking calibration of contractors' equipment.

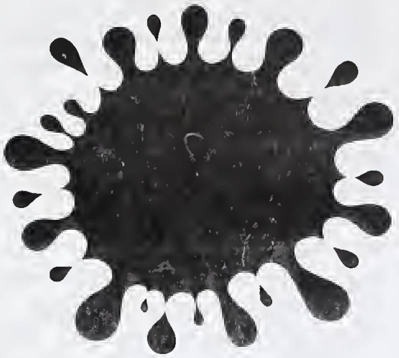
When a QAR or QSR discovers product contamination or deterioration, several regulated steps must be taken, with each decision dependent on such factors as ownership of product, degree of contamination, and intended use of the fuel.

At the quality assurance level, fuel may be rejected if at a lower quality level than that specified in the contract. In cases where fuel already owned by the Government has deteriorated, every effort is made to return products to their original state. Salvaging encompasses chemical or physical means to restore fuel quality. Filtration is helpful for removing sediments or emulsions, dehydration for extricating water from fuel. Inhibiting is the process of using chemical additives such as antioxidants (which prevent gum deposits) to enhance or maintain deteriorating fuels.

The objectives of quality surveillance and assurance are as vital as they are simple: to provide adequate supplies of petroleum products of a quality consistent with operational requirements. The complex means required to reach these ends, however, summon diverse qualities in QARs and QSR: they must be part-chemist, part-detective, and part-athlete. **FL**

"The same types of contaminants which trouble the family subcompact can also affect the operation of jets, tanks, submarines, ships, and the other massive machinery used in our nation's defense."





"Samples containing metal particles that are visible to the naked eye are filtered with the aid of a vacuum system, and the residue is evaluated under a microscope. In cases where a foreign object is present in the lubricating system or unusually rapid wear has occurred, the microscope can aid in determining what corrective actions are needed. In one instance, a cotter pin somehow made its way into a helicopter transmission and severely damaged the oil pump."

ALIVE AND WELL

Army Oil Analysis Program

by Thomas V. Trowell

The Army oil analysis program (AOAP) is alive and well in the 5th Infantry Division (Mechanized) and Fort Polk, Louisiana. The Fort Polk laboratory handles about 50,000 samples annually compared to 1,000,000 handled Army-wide. The nerve center of the program is the oil lab itself where determinations affecting the entire lifespan of equipment are made.

Varying types of division equipment are currently included in the AOAP. The engines on diesel-powered construction equipment, materials-handling equipment, 2½ ton (and larger) wheeled vehicles, and 15 kilowatt (and larger) generators are sampled every 60 days. The engines and transmissions of all tracked combat vehicles are sampled every 30 days. Helicopters and fixed-wing aircraft are sampled on a schedule based on fixed hours of operation.

The sampling process begins with the withdrawal of about 3 ounces of hot oil from the equipment's engine. The sample is sent to the company or battalion AOAP monitor, who screens the accompanying paperwork for accuracy and makes sure that all assigned vehicles are being sampled as required. The monitor then takes the oil samples to the lab where the second phase begins.

Lab personnel assign a number to each sample for control purposes. The series of tests that follow determines the condition of the oil and the extent of internal wear. All samples are processed on the atomic emission spectrometer. This machine is capable of detecting the concentration of 20 different metals that may be present in the oil, 14 of which are routinely monitored. The principle behind this test is that all components consist of critical, metallic moving parts (bearings, pistons, gears). Exposure to heat and friction results in minute particles being generated that remain suspended in the lubricating product. The spectrometer measures the amount of these wear particles and produces a digital readout, in parts per million, for each metal detected.

This readout is recorded on a test record each time. In this way, the wear trend of components is available for reference. Small increases in wear metal indicate normal wear. However, when a radical increase in wear trend is detected, technicians may identify the parts that are wearing at an accelerated rate by the type of metal detected in the lubricant.

The next step involves the use of a direct-readout viscometer that measures the centipoise viscosity of the oil. One purpose of lubricating oil is to maintain a protective film between moving parts. If this film breaks down, heat and friction will destroy the component in a matter of minutes. The lab measures the viscosity to insure that the proper grade of oil is being used. Once this has been established, factors that may change the viscosity, such as a fuel system leak, can easily be detected.

The lab also maintains the oil print analysis card which is a record of the actual cleanliness of the oil. To perform this analysis, the technician places a drop of the sample on qualitative filter paper and allows it to dry and disperse. Again, a trend develops with each sample and components are evaluated based on this trend. If the sample contains an excessive amount of dirt and insoluble matter, the lab may recommend changing the oil and filters. Performing such changes when recommended by the lab eliminates the requirement for owning units to comply with the lubrication order schedule for oil and filter changes.

Testing also reveals the presence of water or coolant in the sample.

A positive analysis showing the presence of water may be indicative of two related problems. First, it indicates there is a leak somewhere in the cooling system that is allowing the coolant to enter the lubricating system. Second, the unwanted coolant displaces the oil, thus preventing it from lubricating properly. This, in turn, causes rapid wear to occur. The lab screens all samples for obvious contamination and uses a centrifuge to separate the coolant from the oil in samples that are contaminated.

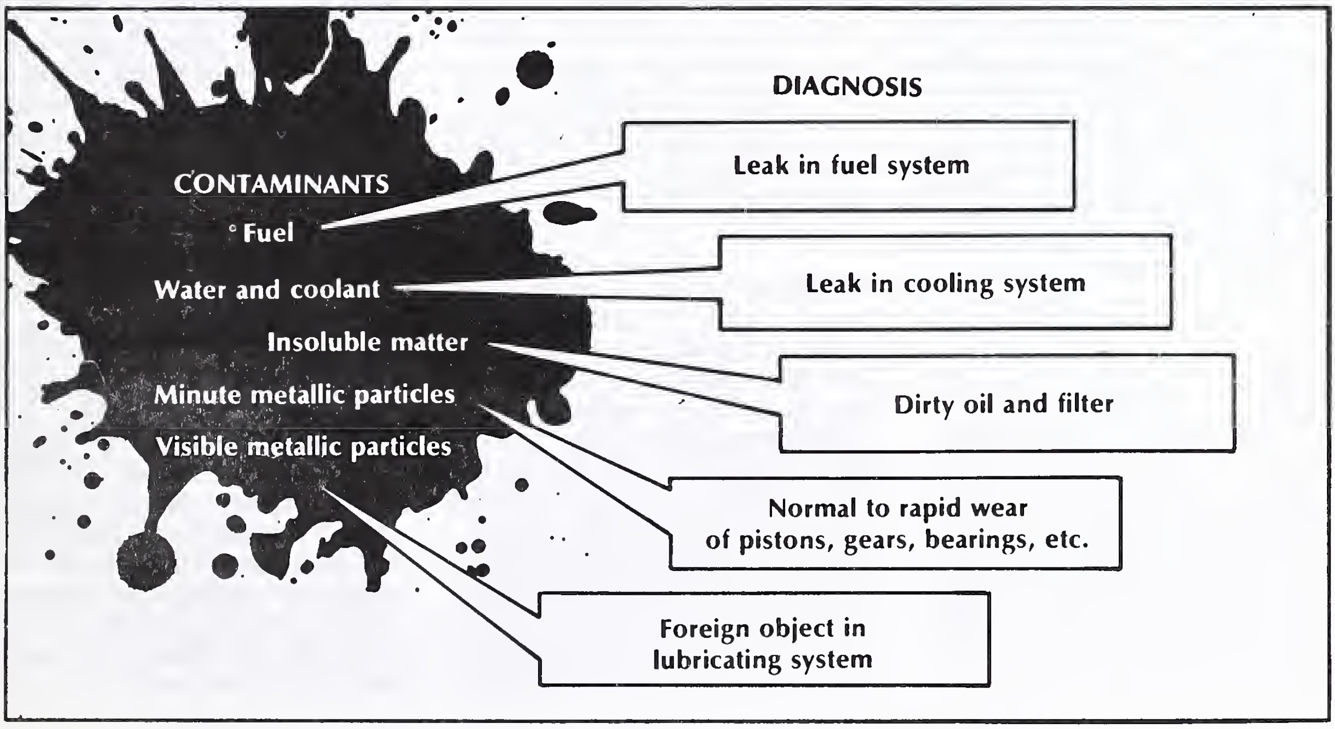
Samples containing metal particles that are visible to the naked eye are filtered with the aid of a vacuum system, and the residue is evaluated under a microscope. In cases where a foreign object is present in the lubricating system or unusually rapid wear has occurred, the microscope can aid in determining what corrective actions are needed. In one instance, a cotter pin somehow made its way into a helicopter transmission and severely damaged the oil pump.

When all the tests have been completed, the lab evaluator goes through each test record and screens the results. When samples check out properly, he files the records to await the next sample. Samples with abnormal results are dealt with in several ways, depending on the particular problem and level of maintenance required.

If an outside contaminant—sand, fuel, or coolant, for example—has entered the system and it is detected early enough, the owning unit is informed of the problem so that corrective action can be taken to extend the life of the component. This may involve changing the oil and filters, inspecting the air-induction system, or tightening loose fuel lines. If the wear metal content is extremely high and irreversible damage has apparently occurred, the component may be removed from service based on the lab recommendation and a full teardown analysis performed.

When corrective action has been completed, maintenance personnel furnish the lab the details of what was required, including the probable cause of the problem, parts replaced, and number of man-hours expended in correcting the problem. The benefits realized by the Army and ultimately the taxpayer through the AOAP are the reduction of maintenance costs and extended life of expensive major assemblies.

A successful AOAP program depends on teamwork. At Fort Polk, the lab is contractor operated. A divisional AOAP monitor insures that the division actions are moving expeditiously and the directorate of industrial operations monitor oversees the entire program. Analysis is available to outlying Army National Guard and Army Reserve component units in Louisiana, Arkansas, and Mississippi. The lab informs the direct support unit or activity of the Active Army, Army National Guard, and Army Reserve units of any recommendations it may have.


DIAGNOSIS
CONTAMINANTS
Fuel
Water and coolant
Insoluble matter
Minute metallic particles
Visible metallic particles
Leak in fuel system
Leak in cooling system
Dirty oil and filter
Normal to rapid wear of pistons, gears, bearings, etc.
Foreign object in lubricating system

"Through oil analysis, the lab technician can identify an abnormal condition and recommend corrective action before irreversible damage is done."

This fulfills its support obligation. The installation rebuild facility also gets a copy of all major maintenance recommendations and gives priority to AOAP items to insure timely and accurate feedback.

Laboratory tours, which are a common occurrence, give company, battalion, brigade, and division commanders an opportunity to become familiar with the program. Some of the conditions diagnosed at the Fort Polk AOAP lab are illustrated with this article and readily attest to the positive results that can be derived from the program.

An even higher degree of efficiency and cost-savings can be realized Army-wide as the program becomes better understood and more widely used. **FL**

ARMY LOGISTICIAN

THOMAS V. TROWELL operates the Fort Polk Army Oil Analysis Laboratory for the Bionetic Corporation, Hampton, Virginia. He has been involved in Army oil analysis since 1976 and worked at the AOAP laboratories at Fort Campbell, Kentucky, and Fort Carson, Colorado, before becoming chief of the Fort Polk laboratory in 1980.

New Mission Assigned to DGSC Underway

by Sandy Wittan

The directorate of contracting and production at the Defense General Supply Center (DGSC) in Richmond, Virginia, was recently assigned purchasing and contract responsibilities for all packaged petroleum products used by the executive branch of the United States. This activity was formerly handled by the lubricants and specialty products division, directorate of contracting and production at the Defense Fuel Supply Center. (DFSC still maintains responsibility for all bulk petroleum products.)

This article, reprinted from the DGSC May 1984 issue of TODAY, *details DGSC's involvement in this new mission.*

Transfer of the mission was completed August 22, 1983, 30 days ahead of schedule. "There have been some problems since the transfer, as could be expected," says Judy Hawthorne, chief of the packaged petroleum products section. "Differences in solicitation format, packaging and inspection requirements, and minor policy differences caused some confusion among contractors. But the major problems have been with the contractors themselves. One firm went into Chapter 11 bankruptcy and couldn't ship material we had under contract until there was a ruling made on the firm's organization. And we could not make any new awards to the firm until the ruling."

"There have been other problems with contractors, too," Judy explained. "Three firms who do a large volume of business with us furnished material which did not conform to the requirements of their contracts. The material could not be issued from stock, and this situation had a drastic impact on our stock availability. It also created the impression that the problems resulted from the mission transfer, even though they could have come to light at any time and were completely unrelated to the responsibility of the mission."

The packaged petroleum products section buys such products as trioxane compressed fuel bars, which are similar to sterno and are used to heat rations, anti-icing compound used on airport runways and planes, decontamination agents used to purify water for shipboard and submarine use, and oil slick removers for dissolving oil spills. Seventy-five percent of the items the section purchases are competitive buys and are bought under Government specifications. The remaining 25 percent are negotiated on a sole source basis when a product bears a firm's part number and specifications and drawings are proprietary.

Many products such as turbine engine oils and aircraft hydraulic fluids are critical to the operation of military aircraft as they would be to any commercial aircraft. Generally, the Federal Government buys the same material used by commercial airlines, but it is purchased under Government specifications for several reasons.

"We use Government specifications to set performance criteria, to accept the material for use by the Government, and to allow for competition," says Pat Doyle, a chemical engineer in the directorate of technical operations.

In addition to their other responsibilities, the section publishes three "bulletins" each year for lubricating oils, greases, and dry cleaning solvents. The bulletins list products available, unit prices, and ordering information from contracts awarded by the section.

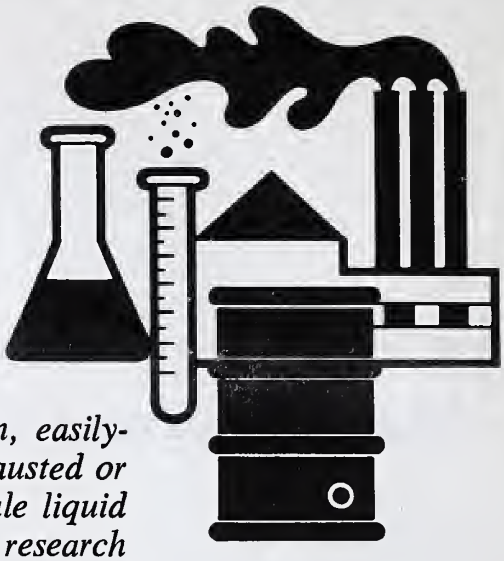
About a year's work goes into publishing a bulletin. Approximately 10 months before the previous year's bulletin is due to expire, the section sends out letters to using activities, asking them to estimate their requirements for the coming year. Then an invitation for bids is prepared, listing the activities and their estimated requirements. "A firm may bid on any or all of the activities' requirements," says Judy, "which means that any number of contracts could be awarded from the one invitation for bids. For example, the bulletin for dry cleaning solvents lists 14 different contractors, and we are expecting to award even more contracts for lubricating oils."

Evaluation of bids for determination of the low bid submitted for each activity's requirements, all factors considered, is a lengthy process. An abstract for one of these invitations for bids may be more than 100 pages long.

After evaluation of the bids, indefinite quantity type contracts are awarded to successful bidders. An indefinite quantity contract specifies a minimum and maximum quantity that may be ordered during the effective period of the contract. Thus an activity may place any number of orders against a given contract as long as its requirements for 1 year meet the minimum and do not exceed the maximum. An indefinite quantity type contract or "IQC" is mutually beneficial to the Government and the contractor. The Government is guaranteed a fixed price for the period of the contract (subject to increases in the Producers' Price Index when an economic price adjustment clause is included in the contract, as is done in the packaged petroleum products contracts), and the contractor is guaranteed a minimum order from the Government.

Then the bulletin is published. Any agency in the executive branch of the Federal Government may order from the contracts listed in the bulletin, so long as it has submitted its requirements and is listed in the bulletin. However, most activities submit their actual requirements to DGSC and the packaged petroleum section writes the delivery orders against the contracts. "The lubricating oils' bulletin this year has an estimated dollar value of $22 million," says Judy. "The greases' bulletin is estimated at $6 million and the dry cleaning solvents at $4 million."

Between the first of October 1983, the beginning of the fiscal year, and the middle of April 1984, the packaged petroleum products section awarded contracts and orders totalling almost $43 million. This figure does not include products in the anti-icing and anti-fogging compound classes. FL



Oil prices may fluctuate but, in the long run, easily-accessible fossil fuel reserves must become exhausted or jealously guarded and new sources of large-scale liquid fuels must be found. Two separate British research projects, both at the University of Manchester Institute of Science and Technology (UMIST), show how science and technology are helping in the search. In one, the high-risk business of searching for new, commercially practicable sites for offshore oil and gas wells is being speeded up, with big savings in cost. In the other, the fermentation of agriculture crops and wastes into fuel alcohol is being made more efficient.

Science Helps Hasten Search for Petroleum

Oil companies drill exploratory wells and bring up samples, which are then analyzed for the richness and maturity of the organic material they contain.

The process by which plant material matures into oil and gas takes about 150 million years; strata which have not had as long as that to mature are unlikely to contain useful amounts of oil or gas.

Conventionally, samples are analyzed by two techniques. One is lithographic logging, in which the types and quantities of fossil material are analyzed. The other is litrinite reflectance, in which the color changes found in the organic matter in the sample are analyzed. Successively higher temperatures at different times will have caused successive color changes from cream through yellow and brown to black. The colors record the temperatures to which organic material has been exposed and this, too, provides data about its maturity.

Ten years ago, a team led by Dr. John Bather in the UMIST Department of Chemistry, then working with the support of the United Kingdom Department of Energy and the Burmah Oil Company, began to develop an alternative technique using analytical chemistry instead of fossil or color records.

Building on earlier work, they looked at the chemistry of samples using pyrolysis, heating a sample in the absence of oxygen and identifying and measuring the amounts of volatile gases that are evolved one by one at increasing temperatures, as solid and liquid organic compounds volatalize. During 4 years' research, the team established the patterns of volatiles given off with increasing time and temperature by samples containing organic matter of different degrees of maturity. The patterns repeated themselves extremely well with similar samples, giving rise to the idea that the technique might be used to analyze samples from exploratory oil drillings. This led to the development of a system used for a commercial service.

Volatile compounds produced during pyrolysis are analyzed by gas chromatography and mass spectroscopy, under the control of a computer which effectively automates the process. Breakdown of a complex mixture of organic compounds known together as kerogen is observed. Ingredients of kerogen, (terpenes and stearenes, the molecules of which are normally held together by links between sulphur, carbon, and nitrogen atoms) break apart and volatilize. Computer programs analyze such things as the ratio of volatile organic compounds with odd numbers of carbon atoms to those with even numbers. In mature strata that promise to be rich in oil, the ratio is near to equality; in very immature strata it is about five to one.

The way in which the complex molecules of chlorophyll, the green pigment that traps sunlight in green plants, have broken down is another factor measured. This provides data about the maturity of the stratum from which a sample has come. These and several other things are compared automatically with the results obtained by pyrolyzing samples of known maturity.

The whole process takes about 1 hour per sample, as compared with between 4 and 14 days for conventional techniques. During the drilling of an exploratory well an oil company takes an average of some 400 samples, of which about half need to be analyzed before a decision can be taken to pursue the work or to abandon it. Each day's offshore drilling costs about $100,000 and the average exploratory well costs about $10 million before drilling is complete.

Only one in ten such wells looks promising enough for oil or gas to be extracted and only one in three of those eventually turns out to be a good commercial proposition. So each economic well trails behind it a cost of around $300 million in wasted time and drilling non-productive wells. Obviously, anything that cuts the time wasted in deciding whether to proceed with wells is going to save a lot of money.

With this in mind, UMIST has set up a company called Datachem. It analyzes samples provided by oil companies, at a cost of $500 per sample. Samples weigh only between 10 and 50 grams, so they are easy to send around the world.

Eventually versions of the UMIST analytical equipment may be developed to allow analysis to be done on the oil rigs. FL

A Self-Controlled Method to Speed Up Fuel Alcohol

Other UMIST scientists have made it possible for one of the alternatives to gasoline and diesel oil—fuel alcohol—to be produced more cheaply.

Alcohol is produced through the fermentation of sugars by yeasts, microscopic fungi which break down sugars to produce the energy they require, meanwhile producing ethanol and carbon dioxide as waste products.

The limit to the strength of the alcohol solution which can be produced by yeasts is set by the fact that above a certain concentration alcohol kills them.

Normally, the performance of yeasts as fermenters falls off sharply when concentrations rise above roughly 10 percent of alcohol by volume, and they are killed before concentrations reach 14 percent. Beyond that strength, alcohol for use in fuel or for other purposes, including drinking in spirits, has to be distilled to make it more concentrated. Expensive energy is used in the process.

Obviously, it would be advantageous to develop strains of yeasts able to work in higher concentrations of alcohol and to work more efficiently in concentrations that impair the performance of existing yeasts.

But the effects of alcohol on yeasts are complex; growth rate, viability and fermentation rate are affected separately, making it very difficult to use conventional techniques to identify and isolate mutants that have a better alcohol tolerance.

Dr. Stephen Oliver and Stephen Brown in the department of biochemistry and applied molecular biology developed an alternative and ingenious approach which has proved successful. They used a feedback system in which the intensity of selection in yeasts that are made to evolve to become more tolerant is fixed by the culture itself, via a feedback circuit.

The technique involves taking the carbon dioxide evolved by the experimental culture and using it to control the switching on and off of a pump delivering alcohol to the culture. When the culture adapted to greater concentrations, by producing mutant strains that were more tolerant, the production of carbon dioxide increased and more alcohol was fed to the culture. Eventually, the rate of carbon dioxide production fell, at which point the pump was automatically switched off.

In this way the UMIST team succeeded in producing strains of yeasts which were able to tolerate higher concentrations of alcohol than the best brewers' yeasts and had fermentation rates of more than twice those of the best lager yeasts in the presence of a concentration of 10 percent alcohol. FL

Reprinted from the Australian Petroleum Institute's Petroleum Gazette, *Autumn 1984.*

U.S. Achieves 80-Day Oil Reserve "Cushion"

The United States has achieved a 400 million-barrel "cushion" in the Strategic Petroleum Reserve (SPR) and "will use it early in the event of a significant supply disruption," Department of Energy Secretary Don Hodel reported in an address to the Washington Press Club.

"At its present level, the SPR could provide more than 80 days supply if all imports to the United States were cut and more than 200 if OPEC [Organization of Petroleum Exporting Countries] imports were cut." He added:

"The 400 million barrels of oil provides a cushion I hope we will never need to use. That is, I hope we will never have a serious oil disruption that would necessitate its use. But we will use it if necessary. And we will use it early in the event of a significant supply disruption.

"When I say early, I mean that when there is a disruption, and we feel it may last for awhile and result in a significant shortfall of supply, we will recommend to the President that we sell from the SPR. It will take about 3 weeks to complete the sale process and start the oil flowing out of the reserve. Obviously, if the disruption turns out to be minor, we can stop the process.

"But if it is more serious, then we are on the way and the world knows we are going to provide a substantial quantity of oil—in excess of 2 million barrels a day—to the market. We can continue that flow of oil for several months, if needed, and at a lesser rate for much longer. I think that would provide a solid stabilizing force while efforts are underway to resolve whatever is causing the shortfall."

The SPR was set up after the 1973 Arab oil embargo to deal with possible future oil supply disruptions.

When completely filled by 1991, the SPR will contain 750 million barrels of crude oil.

[At press time, the SPR contained 424 million barrels of crude oil.] FL

> *"An improved fuel system supply point is recommended for petroleum supply companies. The improvements consist of adding pumps and filter separators and exchanging some of the 10,000-gallon fuel bladders for 20,000-gallon ones. This new fuel system supply point will have the capability of storing 120,000 gallons of petroleum instead of its present 60,000 gallons."*

Logistics Unit Productivity

by Major Greg Ferguson, USA

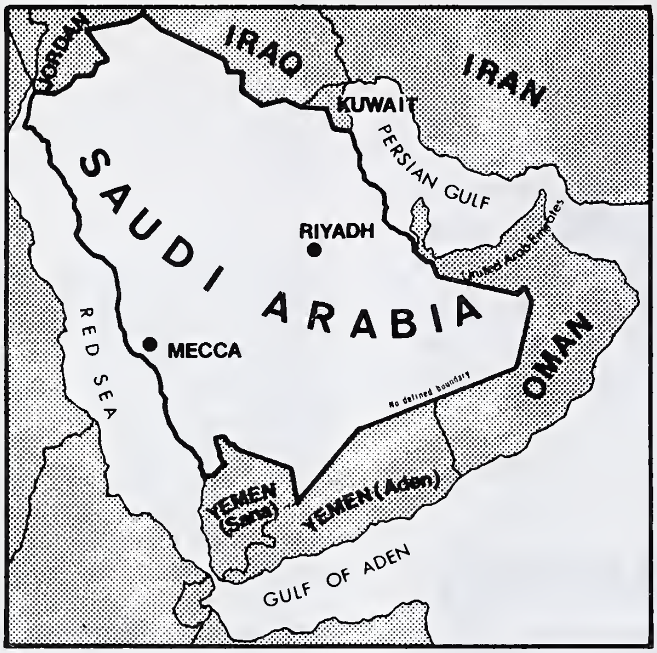
From what you have read already, you know that there is a large gap between the Army's *required* force and the Army's *affordable* force. The logistics community has had a continuing and well-documented force structure shortfall. Combine this with the Army's determination to add teeth (combat strength) to the force while reducing the tail (logistics support) and you can clearly understand the logistics community's concern with reshaping the logistics force. One of the most dynamic initiatives undertaken in this respect is the unit productivity studies.

Logistics unit productivity studies first gained widespread attention with the publication of the article "Transportation Unit Productivity Improved" in the November-December 1983 issue of *Army Logistician* magazine. When this Office of the Deputy Chief of Staff for Logistics (ODCSLOG) study revealed the potential for large increases in capability and productivity in transportation units, it became apparent that similar potential existed in other types of logistics units. The Training and Doctrine Command, through the Army Logistics Center, Fort Lee, Virginia, and its associated schools, began to study ways to improve the productivity of other logistics units. Results of these studies—collectively called the "Logistics Unit Productivity Study"—are now being staffed.

An improved fuel system supply point is recommended for petroleum supply companies. The improvements consist of adding pumps and filter separators and exchanging some of the 10,000-gallon fuel bladders for 20,000-gallon ones. This new fuel system supply point will have the capability of storing 120,000 gallons of petroleum instead of its present 60,000 gallons. The study recommends deleting bulldozers, forklifts, and cranes from this company. These low-density items will be replaced with multipurpose, self-deployable items like the small emplacement excavator. Two different versions of this vehicle are needed. The first would be equipped with a backhoe and excavator, while the second would be fitted with a forklift device on the front and a crane on the back. Implementation of the study recommendations for this company would increase its capability to receive and issue petroleum, oils, and lubricants (POL) from its current 685,000 gallons per day to more than 1,200,000 gallons per day.

The Logistics Unit Productivity Study contains innovative concepts and ideas, using technology to get more done with the personnel resources we have available. There is substantial agreement that replacing people with equipment and consolidating operations will produce savings in the logistics force structure. The current estimate is that if all study recommendations are implemented, 29,000 logistics support spaces could be eliminated. Full evaluation of the study proposals is underway in the program force capabilities analysis. How many and which ones will emerge as best to support and sustain a fighting force remain open questions. **FL**

MAJOR GREG FERGUSON is a logistics project officer in the concepts and doctrine directorate of the Army Logistics Center, Fort Lee, Virginia. He holds a B.S. degree from the Virginia Polytechnic and State University, Blacksburg, Virginia, and an M.B.A. degree from the Florida Institute of Technology in Melbourne, Florida. He is also a graduate of the Army Command and General Staff College.



U.S. Oil Imports, 1973-1984

What About the Persian Gulf?

The United States imported only 28 percent of its crude oil and petroleum products during 1983. Colder weather, lower gasoline prices, and a thriving economy boosted the import share to 31 percent in January and February 1984. Six years ago, the U.S. import level stood at 46 percent and the nation's import level was 35 percent during the Arab oil embargo year of 1973.

The United States imports only 60 percent as much oil from the Organization of Petroleum Exporting Countries (OPEC) now as it did in 1973 and about one-fourth as much as it did in 1977—the watershed year for imports. The same pattern prevails with imports from Arab OPEC nations. The U.S. imports 66 percent as much oil from these countries as was the case in 1973 and between one-fifth and one-sixth as much as in 1977.

GULF COUNTRY IMPORTS

In 1983, Persian Gulf countries provided only about 10 percent of our total net imports and no Middle Eastern country was among the top four suppliers. During the first 2 months of 1984, Saudi Arabia moved into fourth place—providing about 370,000 barrels per day—but this country continues to get only about 10 percent of its imports from the Persian Gulf area. In 1983, Saudi Arabia ranked fifth on the list of foreign suppliers, provid-

Agreement to Keep McClellan Running

The Air Force has signed a unique agreement with California's Sacramento Municipal Utility District (SMUD) that will allow construction of a 49-megawatt power plant on McClellan Air Force Base in California.

SMUD is financing the plant, which will be built on 3 acres of the base. The land was leased to SMUD for 30 years at the cost of $1.

According to Major General Dewey K. K. Lowe, commander of Sacramento Air Logistics Center, the gas turbine plant will provide complete emergency backup power to McClellan. Air Force officials say McClellan is the first base in the United States to have such a capability.

Sacramento Air Logistics Command repairs and ships aircraft components to front-line positions of the U.S. Air Force and to 56 allied nations. Should a massive power outage occur, the new plant will prevent any break in the normal workday activities of the base.

SMUD officials expect to have the plant operational by July 1985.

ing only 335,000 barrels a day or about 8 percent of the imports.

In 1977, Saudi Arabia was the top foreign supplier — providing about 1.4 million barrels of its crude each day—or more than 16 percent of net imports. Now this country imports slightly more oil from all OPEC countries (about 1.9 million barrels a day) than it did from Saudi Arabia alone in 1977.

The U.S. imports only small amounts of oil from Iraq and Iran.

However, about 20 percent of the free world's total oil supply comes from the Persian Gulf and most of it moves through the Strait of Hormuz. The United States would be at least indirectly affected by any shutdown of Persian Gulf supplies because of the effect on world oil suppliers and prices and because of an agreement with the International Energy Agency. The agreement requires the United States to share oil with its allies in the event of a serious oil supply disruption.

The U.S. and world energy markets are in better condition now than 6 years ago. There is considerable excess world oil production capacity (about 3 million barrels a day). In addition, lower consumption and better conservation practices have helped improve the market situation.

There is also more fuel switching to gas, coal, or nuclear energy instead of oil. FL

ENERGY

EIA Forecasts Ample Supplies, Continuing Conservation

Moderate increases in U.S. energy prices but ample supplies and a continuing trend toward increased energy efficiency through 1995 are forecast in the Energy Information Administration's (EIA) new "Annual Energy Outlook."

Also forecast are further shifts to the use of more electricity, coal, and nuclear power.

The EIA report includes projections of prices, consumption, and production based on the assumption that the gross national product rises by 3.3 percent per year from 1983 to 1990, but slows to 2.2 percent per year from 1990 to 1995. At the same time, EIA projects that the average world oil price will decline to $26 in 1986, then rise to $50 by 1995 (in constant U.S. dollars). The principal forecast cases cover the effects of a range of oil prices from $37 to $66 (in 1983 dollars) for 1995.

"Outlook" highlights include:

- Petroleum is expected to continue as the major fuel used through 1995, as oil consumption rises from 15.2 million barrels a day in 1983 to more than 17 million barrels a day in 1995.
- Natural gas consumption is projected to rise from just under 17 trillion cubic feet in 1983 to 17 to 18 trillion cubic feet per year through the rest of the decade. Consumption is expected to return to just under 17 trillion cubic feet in 1995. Electricity is projected to increase its share of total end-use energy consumption, from 14 percent in 1983 to almost 18 percent in 1995.
- Coal will be the major domestically produced energy source by the late 1980's, with its contribution to total U.S. energy consumption increasing from more than 22 percent in 1983 to almost 27 percent in 1995. FL

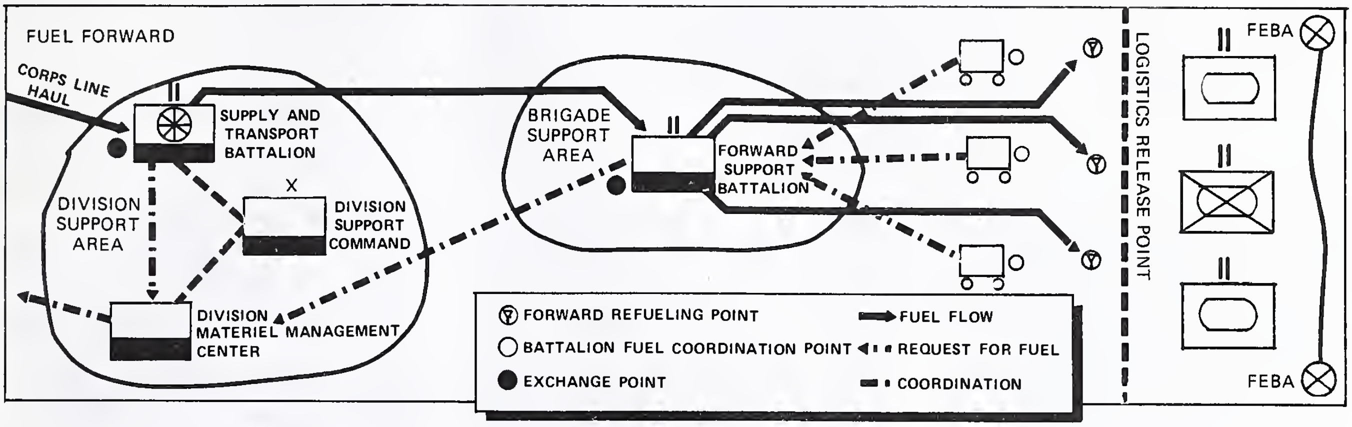
Fast Fuel Forward

by Major Mark Erskine, USA

What has 18 wheels, moves mostly at night, and is the lifeline of the combat vehicles in an armored brigade? If you answered the 5,000-gallon tankers of the supply company of the forward support battalion, then you may give yourself a logistics "pat on the back."

"Fix forward" is one buzz phrase of force modernization and Division '86 planning. Equally important is the concept of "fuel forward," especially with the advent of the M1 tank and the Bradley fighting vehicle (BFV). Satisfying the nearly insatiable fuel appetite of the M1 tank with its 510-gallon bite and its equally thirsty BFV battle partner is a real logistics challenge for troopers of the forward support battalion petroleum section. This small section has only 10 M131 5,000-gallon tankers to move fuel forward. These must be judiciously used in a concentrated logistics "economy of force" operation if the war fighters of Division '86 want to win the first battle with anything more than empty gas tanks.

During a recent Hardened Steel exercise in the 2d Armored Division, the division support command elements were tasked by the commanding general to innovatively fuel forward at night to practice for



the division's night fighting commitment.

The division's materiel management center (DMMC), supply and transport battalion, and forward support battalions are equal partners in getting the right type of fuel, in the right amount, at the right time, to the battlefield. These elements concentrate their actions on getting fuel from the division support area "up" to the brigade support area so that the forward support battalions can move it further forward and sustain the needs of the division's combat elements.

A variety of methods were tried and a number of procedures evolved from the exercise to successfully accomplish this mission.

Forward support battalion fuel requirements are passed to the materiel management center operations center. The center, in turn, coordinates directly with the supply and transport battalion to move fuel to the brigade support area. At the same time, constant liaison with the supporting corps ensures a steady flow of fuel into the division support area by the newly formed pipeline units or by line haul tankers, depending on the tactical situation and location of these units.

A rapid trailer transfer is accomplished at the brigade support area to prevent wasted time in transloading and to take advantage of concealment by the cover of darkness. Good camouflage, wide dispersion, and night movement provide the division support command tanker fleet its best chance of survivability in the battalion support area. Every fueling operation must observe these tenets if the highly vulnerable tanker fleet is to survive.

The forward support battalion provides noncommissioned officers (NCOs) equipped with radios forward of the battalion support area to coordinate with the combat battalion's service support platoon leaders. These individuals play key roles in successfully fueling forward. This is the legendary point where "the rubber meets the road" as far as accurate fuel status and anticipated requirements are determined by aggressive logisticians. These NCOs negotiate a mutually agreeable refueling site as far forward toward the unit's logistics release point as possible.

Under the cover of darkness, the forward support battalion tankers move out to these rendezvous points and refuel the combat unit's GOER fleet (soon to be replaced by the heavy expanded mobility tactical truck [HEMTT]). This cuts down the road time for these cumbersome vehicles and, depending on the needs and distance, allows for at least two nighttime refueling operations per support battalion. A minimum of two tankers per site are sent forward and if two operations are conducted, a total of 20,000 gallons of fuel can be delivered to quench the thirst of our new generation of combat power.

Flexible, innovative, and rapid fuel support is a must under Division '86 doctrine. The logistics community must constantly look for new ways to do business if we are going to participate in a "come as you are" war. Fuel haulers of the forward support battalion will play a major role in combat action by "fueling forward." They just might give us the winning edge we need. **FL**

ARMY LOGISTICIAN

MAJOR MARK N. ERSKINE, USA, is executive officer, 1st Forward Support Battalion, 2d Armored Division, Fort Hood, Texas. He activated and served as commander of the first table of organization and equipment forward support battalion in the Army. He is a graduate of the University of Nebraska at Omaha and the Army Command and General Staff College.

"Some industry experts have now predicted by the end of the decade as many as 120 new coal-burners will be plying the seas worldwide."

Australia Switches Back to Coal-Burners

A decade ago, it was unthinkable —new coal-burning steamships? They were oceanic pariahs, almost. Then came oil price hikes, and more, and more.

Now the Australian National Line (ANL) has taken delivery of its second coal-burner in less than a year, having set the international shipping world agog by ordering, more than 2 years ago, the world's first new coal-burners in at least a generation.

The 75,740-tonne bulk carrier *River Embley* arrived at Weipa, Australia, in July on her maiden voyage, joining the 75,000-tonne *River Boyne* which was delivered by Mitsubishi Heavy Industries' shipyard in Nagasaki in September last year.

ANL hails the *River Embley,* which has a few refinements derived from operating experience with the *River Boyne,* as a "world-beater."
Both the bulk carriers have been put into service to haul 70,000 tonnes of bauxite (a mixture of aluminimum oxides and hydroxides which is a principal source of aluminum) per trip from the Weipa mines to the Gladstone alumina plant in Central Queensland. Gladstone is also a major coal port, which made provision of bunkering easy. It was this ready availability of comparatively cheap coal which made the idea of returning to coal-burning so attractive to the ANL. Fuel oil for bunkers has just about been priced out of the market one way and another. In 15 years, bunker oil has increased more than tenfold in price.

Mitsubishi installed twin coal-fired boilers to power turbines delivering 14,000 kilowatts of power to drive the vessels at just under 17 knots. Each carrier has a bunker capacity of 3,000 tonnes of coal, for a range of 4,500 nautical miles.

ANL is operating the *River* class vessels on charter to Queensland Alumina, Limited, which already operates another new coal-burner, the *Capricornia* (built in Italy) which is to be joined next month by a sister ship, the *Carpentaria.*

Each of the four coal-burners is expected to save Queensland Alumina about $1 million a year in fuel costs. Some industry experts have now predicted by the end of the decade as many as 120 new coal-burners will be plying the seas worldwide.

Shell International Marine, the shipping arm of the oil group, is planning to add coal-burners to its fleet of bulk carriers. This sort of vessel has particular advantages when working out of coal ports, but no one has been rash enough to suggest that liquid-fuel-burners are going to be displaced completely, despite their rising fuel costs. **FL**

Reprinted from PETROLEUM GAZETTE, September 1983, Australian Institute of Petroleum.

Mining For Oil

"But . . . mining *oil? It sounds crazy. However, it's been done before and is a recognized method in practical use in at least two parts of Europe."*

Several weeks ago, British investors rushed in with $26 million, begging their stockbrokers to obtain shares at the London launch of an American-promoted company with the stated intention of mining oil in the deep south of the United States.

It was a hectic 3 hours for the brokers, especially as the newly located Petroleum Mining Company (PMC) had sought only one-fifth of that amount as working capital for venture. Lots of potential shareholders were left disappointed. PMC had itself a real seller's market.

But . . . *mining* oil? It sounds crazy. However, it's been done before, and is a recognized method in practical use in at least two parts of Europe. Actually, oil was mined, in a sense, four decades ago in Australia in the Rannywell shaft dug 400 meters deep in the Lakes Entrance area of Victoria. Between 1942 and 1946, about 1 million liters of poor quality oil were recovered. It was useful as a wartime supplement to supplies, however.

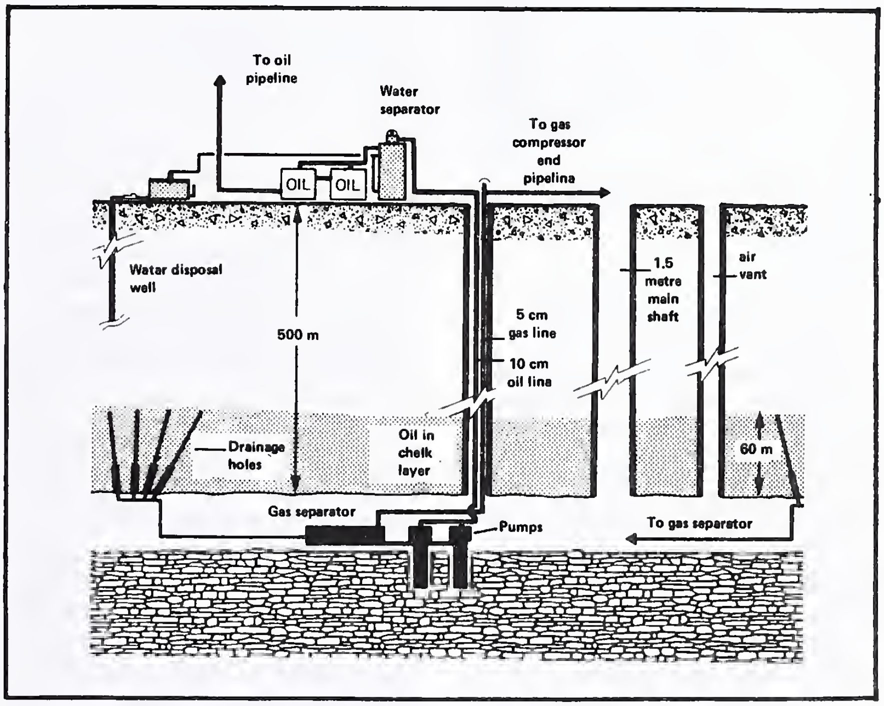
On and off since the 18th century, oil has been mined in the Pechelbronn field in France, but the big oil mine is in the Union of Soviet Socialist Republics. Its Yarega field is producing about 1.5 million barrels per day—roughly four times the daily output of Australia's oil fields—and Russian plans are to boost production to 6.7 million barrels a day by more mining.

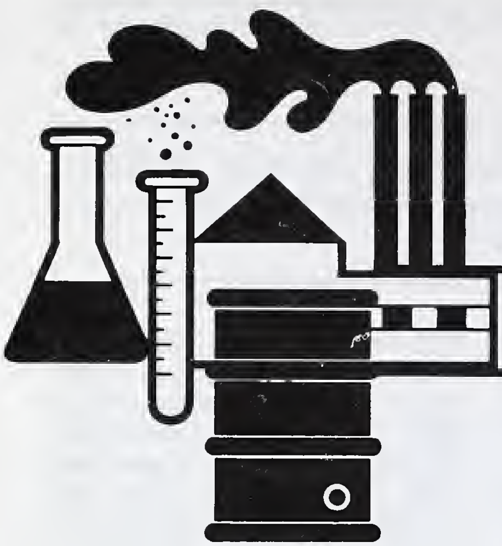
The mastermind behind PMC is an American, William Nathan, who figured that mining could be one way to unlock oil from very tight American geological formations which normally will not release oil into conventional wells. He picked the Pine Island oil field in northwestern Louisiana as a likely prospect—after all, oil was discovered there in 1905 in quantity but an astonishing 16,000 wells drilled there since have hardly been commercial successes; average production is just 1 barrel per well daily.

The oil field is thought to contain about 500,000 barrels of oil per surface hectare, locked into a 60-meter layer of chalk some 500 meters below ground level. Nathan acquired oil leases over 160 hectares, and he estimates that 30 percent of the oil in place can be recovered by mining. (After almost 80 years, only 10 percent of the field's oil has been extracted by all those wells.)

The technique proposed is drilling of a shaft 1.5 meters wide to below the bottom of the chalk layer, and then excavation of horizontal shafts. In these shafts, miners will drill drainage holes upwards to release crude oil which then will be collected and natural gas separated out, underground. Pumps will move the oil to the surface where natural water will be separated from the oil, and the crude put into the production chain via a pipeline. FL

Reprinted from the Australian Petroleum Institute's Petroleum Gazette, *Autumn 1984.*





FUEL LINE GLEANINGS

PUBLIC OFFERED ELECTRONIC ACCESS TO PETROLEUM DATA

Petroleum supply data are now available electronically to the public through the Energy Information Administration (EIA) computer facility. The information, currently found in two EIA petroleum publications—"Weekly Petroleum Status Report (WPSR)" and the "Petroleum Supply Monthly (PSM)"—includes weekly and monthly data on production, stocks, imports, and disposition.

The new service, available free, is offered from 8 a.m. to 11 p.m. weekdays, and 10 a.m. to 6 p.m. on weekends and holidays (eastern standard time). The weekly data from the WPSR's "U.S. Petroleum Balance Sheet" can be accessed after 5 p.m. on Wednesdays. When Monday, Tuesday, or Wednesday holidays occur, access for the weekly information will be delayed 1 day. Monthly data are available by the 24th of the month.

Instructions for accessing the service are available in the latest issues of the WPSR and the April PSM. Further information can be obtained by calling *T.C. Swann, EIA, (202) 252-1155, or the National Energy Information Center, (202) 252-8800.*

POL DISTRIBUTION IMPROVEMENTS SOUGHT

The Office of the Deputy Chief of Staff for Logistics is directing a long-term program to improve the Army's bulk petroleum receipt, storage, and distribution capabilities, especially in undeveloped theaters.

Recent studies have shown that the Army needs to improve its equipment to meet projected bulk fuel requirements. The program will provide fixes in bulk fuels distribution systems. These include adding storage facilities that can be installed with 40 percent fewer personnel in 85 percent less time; establishing the capability to rapidly install tanker mooring systems; adding pipeline systems; increasing pipelaying rates by 300 percent; and avoiding the requirement to activate additional petroleum, oils, and lubricants truck companies.

The program will enable the Army to receive bulk fuels from offshore tankers, store it, and move it forward quickly in large quantities through pipeline systems in any undeveloped theater. By the 1990s, the Army expects to obtain a fully automated, high-speed pipelaying system; additional pipeline systems; and an improved tanker mooring system. The mooring system is expected to save 90 percent of the manpower and 66 percent of the time required to install it.

FARE STUDIES AVAILABLE

A bibliography of studies titled "Refueling Systems and Forward Area Refueling Equipment (FARE)" is available to government employees and government contractors. Write to: *DLSIE, ALMC, Fort Lee, Virginia 23801, or call AUTOVON 687-4655 or commercial (804) 734-4655.*

MONTHLY PETROLEUM DATA AVAILABLE

Monthly data on leaded and unleaded motor gasoline, kerosene, and distillate and residual fuel oil are now available on a state-by-state basis in the Energy Information Administration's (EIA) "Petroleum Supply Monthly." Copies are available for $4.25 or as an annual subscription for $44 from the Government Printing Office or the *National Energy Information Center, Room 1F-048, Forrestal Building, Washington, D.C. 20585.*

DFSC INTERNAL CONTROL PROGRAM SETS TARGETS

As part of the ongoing effort to detect and prevent fraud, waste, and mismanagement throughout the Department of Defense, personnel in the DFSC internal review office (DFSC-CE) are requesting assistance from all DFSC offices, directorates, and Defense Fuel Regions.

Reports which detail efforts to detect or prevent fraud, waste, and mismanagement are due in DFSC-CE by the 25th day of each month. These reports should include information on internal audits, inspection audits, and investigation audits, including case file numbers when applicable. Other items to be reported include significant accomplishments, early warning items, and innovative techniques. Personnel desiring additional guidance or information on the DFSC Internal Control Program may contact Mr. Dubel, DFSC-CE, 274-5957 (AUTOVON: 284-5957).

IMPROVEMENTS TO BIDDERS' LIST

Tina L. Gibson, a procurement clerk in the DFSC small and disadvantaged business utilization office recently suggested that additional information be routinely attached to the Bidders' Mailing List. Her idea to provide a compilation of ordering periods for each of DFSC's annual programs netted her a suggestion award and an accompanying check.

NPR REVENUES OF $1.4 BILLION SEEN FOR FY 84

Revenues from the Federal Government's Naval Petroleum Reserves (NPR) have passed the $1 billion mark for fiscal year 1984 and are expected to reach $1.4 billion by September 30, the end of the period.

The revenues are from the sales and exchange of the Government's share of petroleum produced at the three sites that make up the Department of Energy-administered reserves. NPR crude oil is currently sold on the open market as well as to the Department of Defense. Natural gas and associated liquids, including propane, butane, and natural gas, are also sold on the open market.

Naval Petroleum Reserve No. 1 at Elk Hills, California, is second only to Prudhoe Bay in Alaska in daily domestic oil production. Reserve No. 2, Buena Vista Hills, is adjacent to Elk Hills. Reserve No. 3, Teapot Dome, is located 35 miles north of Casper, Wyoming.

Robert P. James

Robert Paul James, division chief of the former lubricants and specialty products division (DFSC-PG), died on June 26th at his home in Woodbridge, Virginia. Bob was born in Sunbury, Pennsylvania and after a 4-year tour in the Navy, settled in Washington, D.C. where he attended Georgetown University.

He began his career in lubricants and specialty products in December of 1963. and advanced to chief of the division in May of 1980. During his 22 years with the Defense Fuel Supply Center, he received five outstanding performance awards, a certificate of achievement, a letter of recognition, two quality salary increases, and fifteen letters of appreciation.

In 1983, all the major divisional functions of DFSC-PG, except bulk lubricants, were transferred to the Defense General Supply Center in Richmond, Virginia. Despite the great personal demands of his battle against cancer, Bob unselfishly chose to oversee the transition to ensure the welfare of his subordinates. His leadership was characterized by an active concern for his fellow workers, as can be attested to by his co-workers, associates, and many friends at DFSC.

He leaves his wife Carol, who is a DFSC employee, and a son, Bill, an engineering student at the University of Virginia.

Thomas Hickey Chosen as EEO Award Recipient

The 1984 manager's Equal Employment Opportunity Award was presented to Mr. Thomas G. Hickey, DFSC comptroller, during the opening ceremony for the Defense Logistics Agency's (DLA) Multi-Cultural Week in April.

The award, which is sponsored by the DLA Administrative Support Center Equal Employment Opportunity (EEO) Office is given annually to individuals who have excelled in some aspect of EEO management.

Mr. Hickey's award was based on his implementation and management of an affirmative action program in the office of the comptroller during fiscal year 1983. The plan was characterized by a great increase in the number of breakthrough personnel appointments and for the number of upward mobility and executive development training opportunities awarded to his personnel. As a result of the program, progress was made in every career field represented within the office and 22 of 23 selections made were minority or women candidates.

Mr. Hickey has occupied the position of DFSC comptroller since September 1972.

Sterling Dorn Named Outstanding Fuels Manager

The Military Airlift Command named Sterling G. Dorn as an Outstanding Fuels General Schedule Manager for fiscal year 1983. Mr. Dorn, a quality assurance specialist in the quality assurance division of the directorate of technical operations received the award for his previous assignment as chief of the base fuels management branch, accounting and administrative section at Andrews Air Force Base, Chief of Supply Division and 76th Airlift Division. He was specifically cited for his achievements with the computerized standard base supply system and associated program logic.

The first Quality Surveillance Representatives' (QSR) Course was held at Cameron Station on 4-15 June 1984. Graduates included (front row, left to right): Albert Russo, Defense Fuel Region Northeast (DFR-NE); Jean Lacherite, DFR-NE; Steven Kellner, DFR-Southwest; Thomas Butcher, DFR-West; (top row, left to right): Carl Knighting, DFR-NE; Terry Knight, DFR-NE; and Captain Larry Moore, DFR-Caribbean.

The course covers various aspects of bulk petroleum QSR duties, with emphasis on Defense Fuel Support Point contracts, the procurement quality assurance program, and terminal activities.

Darlene Robinson Selected for DLA Business Award

Mrs. Darlene Robinson, a contract administrator in the production division of the directorate of contracting and production recently received a Defense Logistics Agency Excellence in Assisting Small and Disadvantaged Business Award. The award was based on Mrs. Robinson's aid to a small and disadvantaged business which had received several contracts to supply products to posts, camps, and stations.

Strategic Air Command Receives First Re-engined KC 135Rs

The Strategic Air Command (SAC) is receiving some of the 392 KC-135R tanker aircraft scheduled for reconditioning by fiscal year 1993.

The modernization program, which includes new engines, a revamped steering mechanism, and modifications to landing gear and monitoring systems should extend the life of the aircraft another 20 years. The new contingency for movement (CFM) International CFM56 engines, which can produce 22,000 pounds of thrust, have seen some 500,000 hours of commercial service on re-engined DC-8s. In all, more than 34 aircraft systems or subsystems have been replaced or modified.

The modified aircraft will provide a 50-percent increase in fuel off-load capability, 25-percent reduction in fuel consumption, 95-percent reduction in noise levels, 76-percent reduction in smoke emission, 66-percent reduction in gaseous emission, and 20-percent reduction in takeoff distance.

The overall effect of the modernization effort will be a 50-percent increase in SAC's tanker force capability and a sharp decline in operating costs. An increase in tanker capability is needed because of increased demands for aerial refueling. Since 1960, the number of air-refuelable aircraft has jumped by more than 600 percent while the actual number of available tankers has dropped by some 25 percent. FL

Shale-Derived JP4 Fuel Powering Fighters

F-111s and transient aircraft at Mountain Home Air Force Base, Idaho, will begin operational testing of aviation turbine fuel, grade 4 (JP-4) derived from oil shale rock later this year. F-16s and other aircraft at Hill Air Force Base, Utah will test the fuel in early 1985.

Shale-derived fuel costs approximately 5 cents more per gallon than conventional fuel, according to Charles L. Delaney, Aeronautical Systems Division's manager for the shale oil fuels program in the Aero Propulsion Laboratory at Wright-Patterson Air Force Base. However, because estimates of oil trapped in shale in the United States are as high as 1 trillion barrels, the Air Force is investigating its potential. Long-range goals for shale-derived JP-4 are to insure acceptable quantities and to reduce United States dependence on foreign crude oil.

Conventional JP-4 and shale JP-4 contain the same mixture of heavy naptha and kerosene. Both have additives to control corrosion, lubricity, oxidation, icing, and bacterial growth and have a maximum freezing point of minus 58 degrees centigrade.

Engines for the F-15, F-16, F-111 aircraft, helicopters, and auxiliary power equipment were ground-tested and dismantled earlier this year. No adverse effects were found in any of the engines and equipment tested with shale-derived fuel.

The program, which will be managed by the Air Force Logistics Command at Wright-Patterson, was approved in July by Chief of Staff General Charles A. Gabriel.

What's a Few Billion Between Friends?

Reprinted from the Australian Petroleum Institute's Petroleum Gazette, *Autumn 1984.*

The numbers read rather like a gigantic lottery entry—but that's the way billions are being thrown around in estimating Mexico's oil reserves. Are they 75 billion, 106 billion, 30 billion, 85 billion or even 78.5 billion barrels?

It all started again late in January, when a senior official of Mexico's State oil company, Pemex, announced at an oil seminar that exploration at an intensive level had raised Mexico's oil reserves to a total of 75 billion barrels, up 3 billion from the 1981 estimate.

The official, Señor Miguel Angel Zenteno, said new oil fields had been discovered but he did not give any locations.

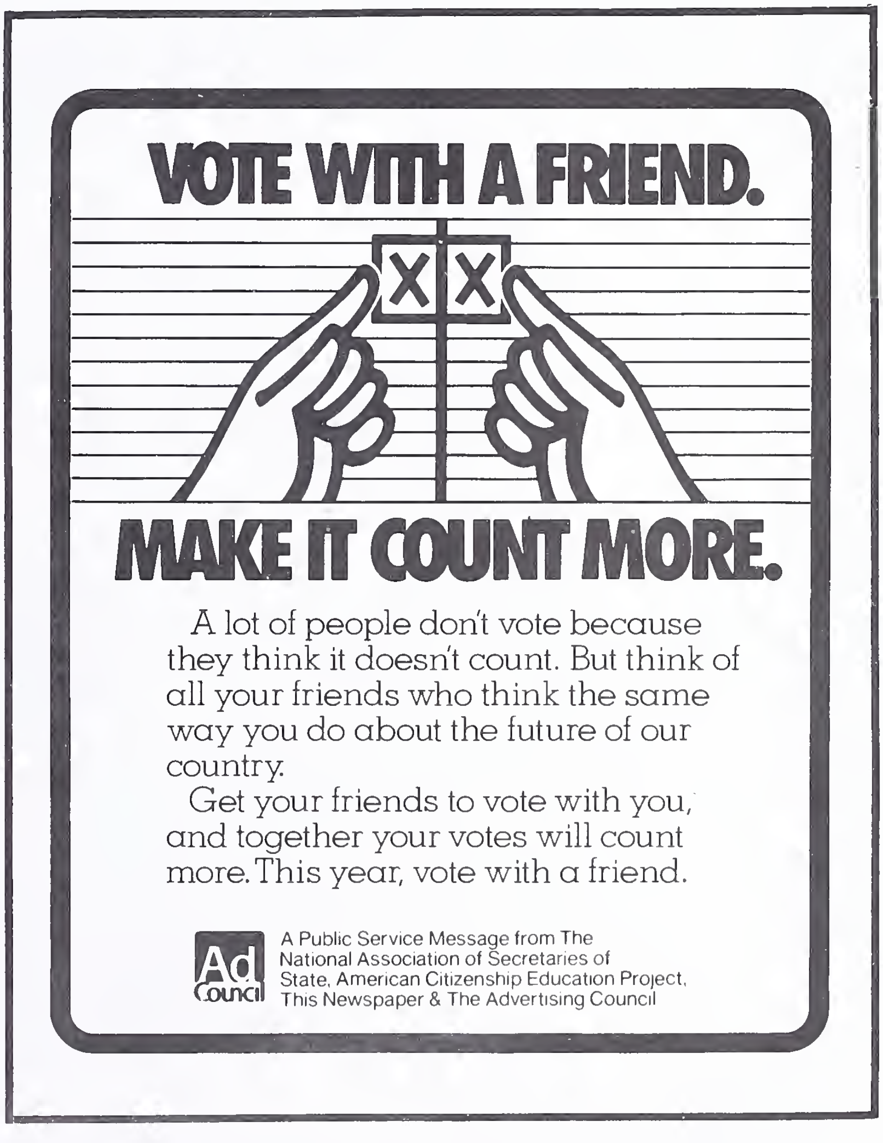
This figure, in itself, was quite enough to arouse a new flurry of interest in Mexico. But then the Mexico City-based stock analysts, Allen W. Lloyd Company, predicted that in the financial year ending this June 30, Mexico would become the world's second biggest oil producer, if production started at new wells in Campeche Bay.

And just to keep the pot boiling, the analysts pulled a figure of 106 billion barrels from somewhere as an estimate of the country's oil reserves.

That set going compilation of other estimates: the Organization of Petroleum Exporting Companies put its figure for Mexico at 85 billion barrels, British Petroleum published a 78.5 billion barrel estimate, and the United States Energy Department came in on the low side—30 billion barrels.

For the record, published estimates for December 31, 1982 (made by *World Oil* and recently reissued by Shell) put Saudi Arabia's proven oil reserves at 168 billion barrels, Kuwait's at 71 billion (out of the Middle East's total of 358 billion), North America's at 84 billion, and the world figure at 681 billion.

FL


VOTE WITH A FRIEND.
X
X
MAKE IT COUNT MORE.

A lot of people don't vote because they think it doesn't count. But think of all your friends who think the same way you do about the future of our country.

Get your friends to vote with you, and together your votes will count more. This year, vote with a friend.

Ad Council

A Public Service Message from The National Association of Secretaries of State, American Citizenship Education Project, This Newspaper & The Advertising Council

☆U.S. GOVERNMENT PRINTING OFFICE: 1984 461 164 10060

UNIVERSITY OF FLORIDA
3 1262 09683 6670

FLARE

VETERANS DAY MESSAGE FROM THE SECRETARY OF DEFENSE

On this Veterans Day, in this year of 1984, when our nation is at peace, we honor the gallant men and women of our military forces, past and present, who have purchased that peace with their unselfish service and sacrifices.

Americans are proud of their Veterans. We have entrusted to them the preservation of our nation's heritage and freedom, and our Veterans have never betrayed that trust.

Our Veterans have borne the burdens of freedom, and they have helped maintain our nation's preeminence as a world leader. They have provided the strength and commitment necessary to deter war on our nation and our allies.

On behalf of the Department of Defense, I express sincere appreciation to all our Veterans who have given this great nation and their fellow countrymen a valuable legacy, a legacy of peace with freedom.

DFSC-AP

DEFENSE LOGISTICS AGENCY
DEFENSE FUEL SUPPLY CENTER
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

THIRD CLASS MAIL
POSTAGE & FEES PAID
DEFENSE LOGISTICS AGENCY
PERMIT No. G-53